

Armoured Cars—Marmon-Herrington Alvis-Straussler, Light Reconnaissance

by B. T. White

50p
Profile



MARMON-HERRINGTON MK II



S.A. ARMoured RECONNAISSANCE CAR MK VI



STRAUSSLER AC 2



HUMBER MK III

AFV/Weapons Profiles

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Armoured car of C Squadron, King's Dragoon Guards, dug in at Tobruk, September 1941. This is an example of the early riveted-hull version of the South African Reconnaissance Car, Mark II.
(Photo: Imperial War Museum)

The South African built Marmon-Herringtons

by B. T. White

THE Government of the Union of South Africa gave orders in August 1938 for the construction of two experimental armoured cars. Work proceeded slowly, so when war broke out in September 1939 enquiries were made to see if either existing armoured car designs, adaptable to South African needs, could be provided by the War Office or if complete armoured cars could be supplied from the United Kingdom or the U.S.A. Since none of the requirements could be met, the order for two armoured cars was increased to seven of the same type and then another twenty-two were added so that an experimental armoured car company could be equipped. The orders for armoured cars to be manufactured in South Africa was further increased to a total of 266 in October 1939.

In the meantime, the original model of armoured car, based on a conventional Ford 3-ton lorry chassis with two-wheel drive, was joined by a new experimental model on the same basic type of chassis but with Marmon-Herrington conversion to four-wheel drive. This vehicle was delivered in Johannesburg on September 18, 1939, and subjected to an exhaustive series of tests over the next few months, both on roads and cross-country in the eastern Transvaal.

After modifications to the cooling and suspension systems and further tests in January 1940, this type was accepted for production.

The order for 266 armoured cars was increased to 1,000 following the *Blitzkrieg* in France in May 1940 and, in the following month, the spread of the war to the African continent. Delivery of 50 armoured cars per week was required and the resources of South African industry were marshalled to cope with what was an entirely new venture in the Union. No armoured vehicle had been built there before 1939, but although there was no local motor manufacturer there were subsidiaries of Ford and General Motors for the assembly of imported North American chassis (some bodies were built in South Africa), and heavy industry—chiefly associated with mining—was well represented.

Responsibility for the production of armour plate was taken by the nationalized South African Iron & Steel Industrial Corporation (Iskor); the chassis imported from Canada (together with four-wheel drive conversion kits from the Marmon-Herrington Co., Inc. of Indianapolis, U.S.A.) were assembled by the Ford Motor Company of South Africa (Pty.)



South African Reconnaissance Car, Mark I. This particular vehicle is now an exhibit in the South African National War Museum
(Photo: S.A. National War Museum)

Ltd., and the Dorman Long structural steel company, together with other contractors, undertook final assembly of the complete armoured cars. Many sub-contractors, including the South African Railways workshops, were involved. All the armament for the South African armoured cars was supplied from the United Kingdom, except Browning machine-guns for the Mark IV and later models.

Marmon-Herrington, Mark II, of C Squadron, King's Dragoon Guards, in the break-out from Tobruk at the end of November 1941.
(Photo: K.D.G. History)



MARKS I AND II

The first 1,000 armoured cars, of which the first few vehicles were delivered in May 1940, and in numbers from July onwards—the last in May 1941, were designated South African Reconnaissance Cars, Marks I and II. The former, of which 113 were built, was the original two-wheel drive version on a Ford 3-ton lorry chassis, shortened to a 134-inch wheel base and strengthened.

The hull was on fairly straightforward lines but, considering the lack of outside assistance, was a creditable design with no vertical surfaces. The interior was roomy and unobstructed, with adequate space for the crew of four men. The armament, as originally fitted, consisted of one Vickers 0.303-in. water-cooled machine-gun in a ball mounting in the circular turret and another in the left hand side of the hull. The last was an archaic idea of little use in practice, derived apparently from early British medium tanks.

The form of hull construction in early vehicles of both Marks I and II was either riveted on to a mild steel frame or welded. The welded type was much the better, however, and soon predominated, and welding alone was used for all subsequent Marks. Access to the armoured car was by means of a large double door at the rear and by two other doors each side of the driver's position. The design of these forward doors was changed during the production run to smaller square doors set further back and better suited to the welded type of hull. Some slight changes were made in the Mark II to accommodate the four-



"Breda" car. Marmon-Herrington Mark II of The Royal Dragoons modified to take a captured Italian 20-mm. Breda gun. Unless a patrol was accompanied by a Breda car it had very little striking power. "It was generally supposed that the Boys anti-tank rifle . . . was unable to pierce any armour other than that of the Marmon-Herrington armoured car itself," wrote The Royals' regimental historian. (Photo: Major K. G. Balfour, M.C.)

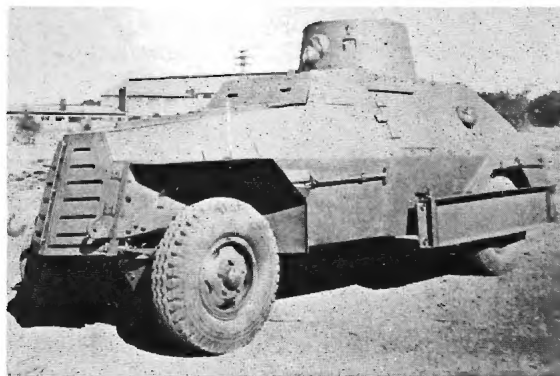
wheel drive—chiefly in the design of the front mudguards to allow greater clearance. Also, the unditching channels were re-positioned.

Mark I and Mark II armoured cars were first handed over to the South African Armoured Car Companies in May and November 1940, respectively, and were used in action against the Italians in East Africa. They were, on the whole, quite successful, but the going was very hard, particularly for the two-wheel drive cars and the engines used a lot of oil. The springs were found to be insufficiently strong and the U-bolts sometimes broke. Also, before bullet-proof tyres were introduced, punctures were often caused by thorns.

The successful initiative of the South African government in getting armoured cars into quantity

Marmon-Herrington, Mark II. Later version with welded hull and forward doors set further back. Ball mounts for machine-guns in turret and left hand side of hull can be seen.

(Photo: S.A. National War Museum)



production was followed with interest by the War Office in England, and the South Africans were asked to supply cars for use in the Middle East. As a first step 400 Mark II cars were provided out of the 887 built or building for the South African government. These were all four-wheel drive cars and mostly of the welded type. They were designated "Armoured Cars, Marmon-Herrington, Mark II" (although, incidentally, they were—and still are—frequently and incorrectly referred to in British circles as "Marmon-Harringtons") so that the Mark number, although not the rest of the designation, corresponded with South African usage. However, it seems that "Marmon-Herrington Mark I" may have been applied to the few four-wheel drive cars in the Middle East with riveted hulls, although this point does not appear to have been satisfactorily explained.

The cars supplied for service in the Middle East were equipped to a standard laid down by the War Office and a rectangular plate was added to the turret face to take a mounting for a 0.55-in. Boys anti-tank rifle (a few cars in East Africa had had this weapon) and a 0.303-in. Bren light machine-gun. There were also pintle mountings on the front and the rear of the turret for another Bren gun and a 0.303-in. Vickers machine-gun respectively, although it does not seem that the second Bren gun was usually carried in practice. The hull machine-gun position was plated over. A proportion of the cars were fitted with W.D. type wheels with split rims, although these may have been substituted for the standard rims after their arrival in Egypt. The first Marmon-Herrington Armoured Cars were received in the Middle East about March 1941.



Marmon-Herrington, Mark II, of the King's Dragoon Guards patrolling Benghazi, Christmas Day, 1941. (Photo: K.D.G. History)

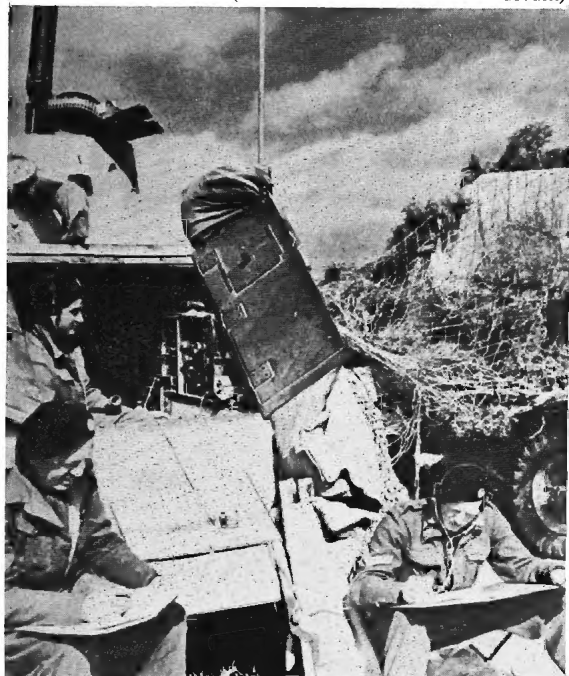
MARK III

Further large contracts for armoured cars were placed by the War Office and the South African government and before the Mark II went out of production in May 1941 a new model, Mark III, was designed to take its place in the production lines.

The South African Reconnaissance Car Mark III (or "Armoured Car, Marmon-Herrington, Mark III")

Marmon-Herrington, Mark II, had two large doors at the back and a roomy hull. This car of a South African armoured car unit HQ has a No. 9 wireless set.

(Photo: S.A. National War Museum)



to the War Office) again used the Marmon-Herrington Ford chassis, but this time further shortened to a wheelbase of 117 in. Mechanical improvements introduced by the designer, Captain D. R. Ryder, included a strengthened front axle, improved springs, a heavier pattern steering box and an additional radiator—all features suggested by experience with the Mark II. The all-welded hull was of the same general shape as that of the Mark II but was redesigned to improve the angles and increase the effectiveness of the protection. The turret also was redesigned—an eight-sided structure taking the place of the circular type. Access was by means of side doors only in the Mark III. The basic armament remained the same—an anti-tank rifle and two machine-guns, one of them for anti-aircraft use. No provision was made for a hull machine-gun in Mark III, however.

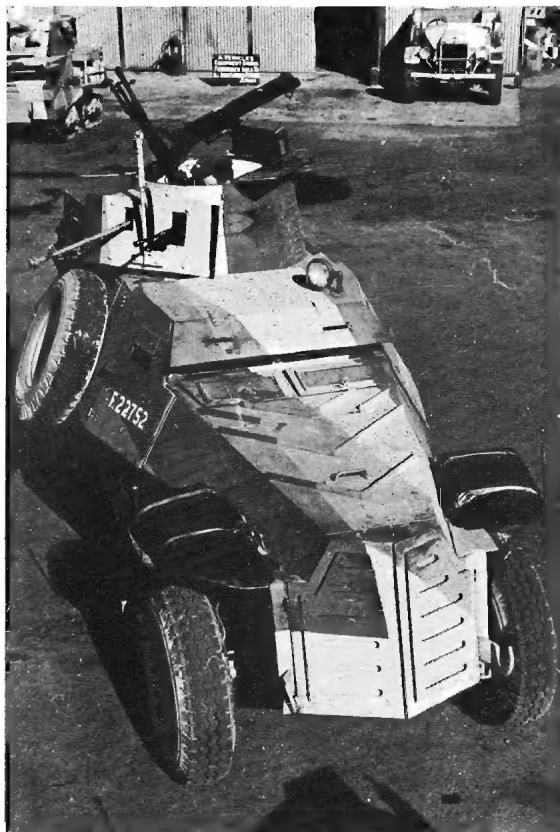
Total orders for Mark III cars for both the War Office and the U.D.F. (Union Defence Force) amounted ultimately to 2,630 and the last cars were delivered in August 1942. During the course of the production run various changes were introduced. The original vehicles had horizontal armoured radiator grilles and square headlamp covers. First, the grille front was replaced by "solid" front armour and subsequently the headlamp covers were omitted. The next and most important change was the introduction of a single rear door, necessitating moving the spare wheel from the back to the left hand side of the hull. Although these variants do not seem to have been distinguished in official nomenclature (all are referred to as "Mark III" in production figures) the final version with all the modifications including the rear door seems to have been known to the U.D.F., at any rate, as Mark IIIA. The rear door was included in response to user demand, because the original Mark III was found to be difficult for the crew to

evacuate in emergency, compared with the Mark II with its two large doors at the back.

The South African armoured cars were arriving in good numbers in Egypt by early 1942 and they performed very useful service in the Desert campaigns with British and South African armoured car regiments—cars built to the order of the War Office and the Union Government (the latter bearing “U” registration numbers) soon became well mixed up and in a common pool. The main fault in the cars as supplied to the troops was the lack of a heavier weapon than the Boys anti-tank rifle, which was a single shot weapon of limited usefulness. Some Mark II cars in the Middle East were “officially” modified early in 1941 to take captured Italian Breda 20-mm. guns and these were the first of a host of modifications to improve the hitting power of the Marmon-Herrington Armoured Cars. Later changes were carried out by unit or formation workshops and because they were not formally sanctioned by G.H.Q. the captured weapons were usually removed when armoured cars were sent back to base for major repairs.

The weapons known to have been fitted included the Italian 47-mm., German 37-mm. and French 25-mm. anti-tank guns on both Mark II and Mark III series cars and the German 28-mm./20-mm. tapered bore gun on Mark IIIA.

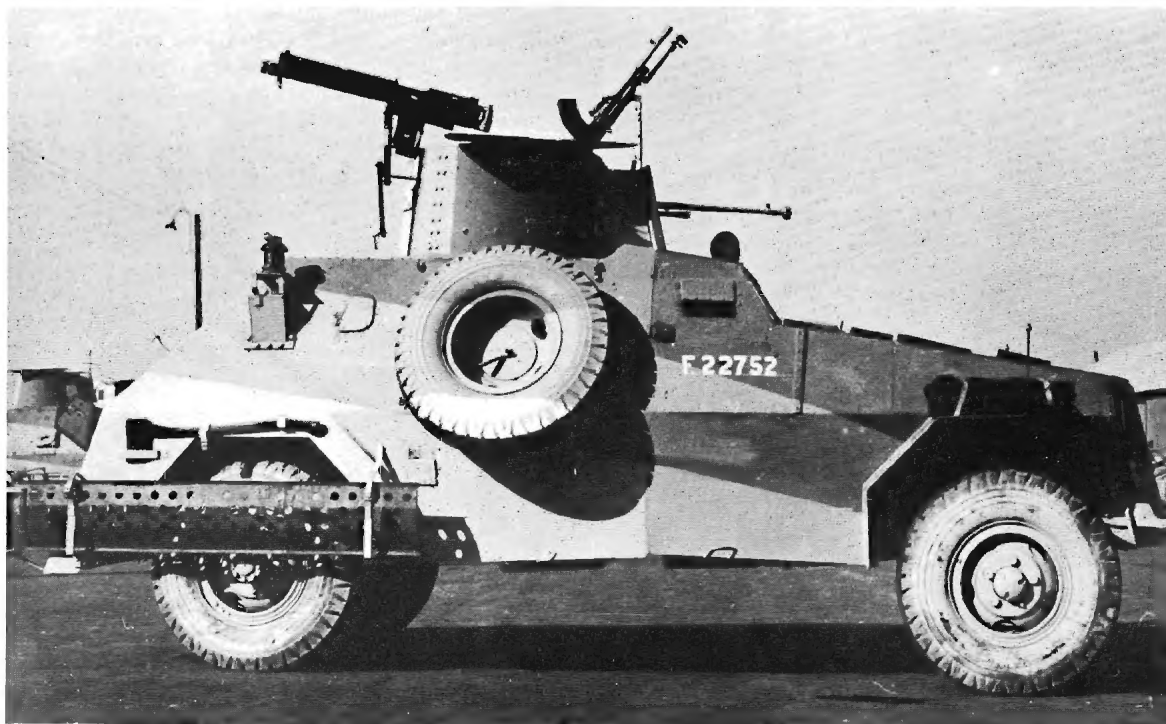
The 4th South African Armoured Car Regiment claimed to be the first to fit into an armoured car a gun really effective against tanks and armoured vehicles—a 2-pdr. from a knocked out British tank was mounted in September 1941. This proved to be so valuable in use that by the following January each troop in this Regiment had at least one car fitted with a gun of between 37-mm. and 47-mm. calibre.



Top view of Marmon-Herrington, Mark II, The mounting of the guns in the turret was such that, according to The Royals' historian, "most car commanders preferred to forego the security of the armour and shoot always with the machine-gun mounted for anti-aircraft upon the top."

Side view of Marmon-Herrington, Mark II, showing full armament: Boys anti-tank rifle, two Bren guns, and a Vickers machine-gun. Dimensions are: Wheelbase 11 ft. 2 in., track 5 ft., length overall 16 ft., width overall 6 ft. 6 in., height to top of turret 7 ft. 3 in., tyres 9-75 in. x 18 in.

(Photo: R.A.C. Tank Museum)



Other modifications of S.A. Armoured Cars were as Light Aid Detachment vehicles and, with turrets removed, as O.P. cars for the artillery. A turretless Mark II car was fitted with a quadruple Bren anti-aircraft mounting, and twin 0.30-in. Brownings or a single Vickers were carried on others. A new design of Mark IIIA was produced in South Africa which had the normal late type of hull with rear door but the turret was omitted and an open ring mounting for single or twin Vickers machine-guns—usable against air or ground targets—provided in the turret ring. Like all the turretless versions, this car was better suited for close reconnaissance duties than the rather tall Marmon-Herrington Mark IIIs in their standard version.

South African armoured cars—chiefly Mark IIIs in their different versions—in addition to being supplied to the War Office were used by the Indian Army, and were exported to the British East and West African Colonies, Southern Rhodesia, Malaya and the Dutch East Indies. Many of those sent to the last two Far Eastern countries fell into the hands of the Japanese.

MARK IV

An entirely new design of armoured car built around a 2-pdr. gun, was drawn up in South Africa in 1941–42. This, the S.A. Armoured Reconnaissance Car, Mark IV, employed basically the same Marmon-Herrington Ford components and engine as the earlier models but, for the first time, no orthodox chassis was used, the armoured hull itself taking the place of a chassis. A rear-engine configuration was adopted, bringing the need for some special mechanical modifications and the provision of extra control linkages. In some of the early cars (designated Mark IV X) the engine at the rear was mounted facing forwards with the gearbox behind it, with the radiator at the back of the car, air being drawn through the rear of the hull. Only 96 cars of this type were built, all the others having the engine facing the rear, so that the gearbox was in front, and air was taken in from the fighting compartment through the radiator mounted on the dividing bulkhead.

The method of welding construction developed in earlier vehicles was used for the Mark IV, which had both hull and turret fabricated by the welding process.

South African Reconnaissance Car, Mark III, with its designer, Captain D. R. Ryder. Armament is a Boys' anti-tank rifle, a Vickers machine-gun, and a Bren gun.

(Photo: S.A. National War Museum)



South African Armoured Reconnaissance Car, Mark VI, second model. This has a 6-pdr. as its' main armament, and a co-axial 7.92-mm Besa, and a single 0.5-in Browning for anti-aircraft use. This car is in the South African National War Museum.

(Photo: S.A. National War Museum)

Experiments were conducted with a 2-pdr. gun tank mounting but it was decided that the turret of the Mark IV was too light for this type of mounting and so a 2-pdr. field mounting was adopted instead. No provision was at first made for a coaxial machine-gun in the turret, but later a water-cooled Vickers was mounted, to be replaced by a 0.30-in. Browning air-cooled machine-gun on a "coupled" mounting in most vehicles built. An anti-aircraft machine-gun was carried on the turret roof—a 0.50-in. Browning in some early vehicles, the 0.30-in. weapon being standardized later.

The delivery of Mark IV armoured cars was limited by the supply of automotive components from North America and guns from the United Kingdom. The armament difficulty was no doubt the reason why some cars supplied to the Union Defence Force for home use were equipped only with a 0.5-in. Browning in a turret ball-mount instead of the 2-pdr. Another large order for some 1,200 armoured cars for use in the Middle East was placed by the United Kingdom government in addition to the considerable quantity required by the South African Army and so to overcome the problem of uncertain deliveries of Marmon-Herrington-Ford components, arrange-

C Squadron of The Royals relieving A Squadron near Bir Tenger, midway between Gazala and Msus. This photograph shows some of the variations in the Marmon-Herrington Mark III series. Car on the right has early horizontal armoured radiator grilles; the left one has "solid" front armour. Both have square headlamp covers.

(Photo: Major K. G. Balfour, M.C.)



ments were made for Canadian Ford F60L four-wheel drive 3-ton lorry chassis to be diverted to South Africa from War Office orders for the Middle East Forces. A modified design, the S.A. Armoured Reconnaissance Car, Mark IVF (known, not strictly accurately, in War Office nomenclature as Armoured Car, Marmon-Herrington, Mark IVF) was produced which utilized the automotive components from these Canadian 4×4 lorry chassis in place of the Marmon-Herrington Ford parts. The changes needed were not great, because the Canadian-built 4×4 trucks used the Marmon-Herrington design of front axle and transfer box, etc. Almost the only external difference, in fact, between the Mark IV and the Mark IVF lay in the wheels, which in the latter were of the standard British W.D. split rim pattern and the front hubs lacked the embossed "MH" which appeared on the 4×4 converted vehicles.

A grand total of 2,116 Mark IV armoured cars (of which 1,180 were Mark IVFs) was built, although the anticipated production flow could not be achieved and none were received in the Middle East in time to be used in the North African battles. They performed useful service in the forces of colonial territories and Allied forces, including the Free Greeks and the Arab Legion. A few were employed after the war by the British Army in Palestine as rail cars, coupled together in pairs.

South African built Marmon-Herringtons found their way all over the Middle East—and further afield as well. This photograph was taken in Cyprus in February 1943, at the inspection of the 8th King's Royal Irish Hussars by the G.O.C.-in-C. Cyprus. The cars are Mark IIIs—without rear door. Whatever their faults, all users agreed on the reliability of the Ford V-8 engine.

South African Armoured Reconnaissance Car, Mark IV. This car is in the standard form for this Mark. The Mark IVFs sent to the Middle East forces were equipped in similar fashion, including the 0.30-in. Browning A.A. mounting. (Photo: R.A.C. Tank Museum)



Marmon-Herrington, Mark III, stuck in soft sand. This is a late version (Mark IIIA) with "solid" front armour, absence of square headlamp covers, and spare wheel on left hand side of hull. The turret is fitted with a captured German 28/20-mm. tapered anti-tank gun.
(Photo: K.D.G. History)





Consignment of South African Armoured Reconnaissance Cars, Mark IVF, leaving Dorman Long's factory in South Africa for the Middle East.
(Photo: S.A. National War Museum)

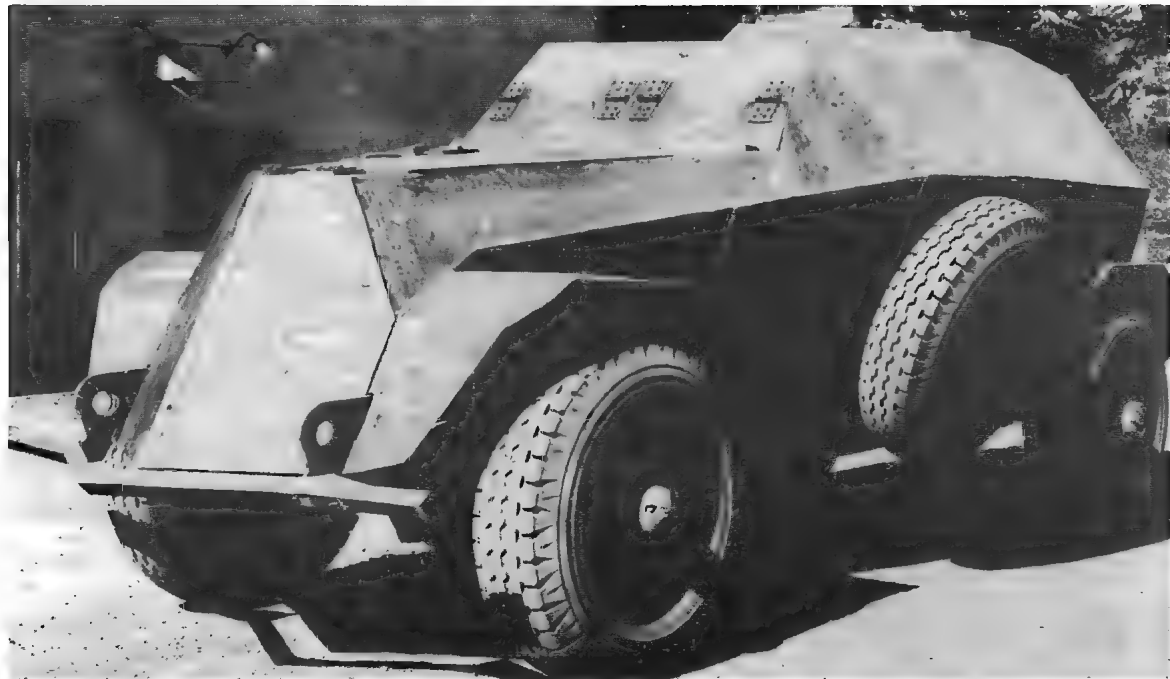
MARKS VI, VII AND VIII

Besides the four basic Marks which were mass produced, several other designs were produced in South Africa in World War II which did not get beyond the prototype stage. The most interesting of these was the Marmon-Herrington Mark VI, an eight-wheeler armoured car inspired by the German heavy armoured cars and intended to take full advantage of conditions offered by the North African terrain. This car, with drive on all wheels, employed two sets of 4×4 Marmon-Herrington components and a power unit consisting of two Ford (Mercury) V-8 engines of 95 b.h.p. each mounted at the rear. Armour protection was increased to a maximum of 30-mm. (compared with the 12-mm. maximum of Marks I-IV) and the armament was carried in a multi-sided turret reminiscent of that of the British Crusader tank. The armament in the first car consisted of a 2-pdr. gun and coaxial 0.30-in. Browning machine-gun and, on top of the turret, a ring mounting for two 0.30-in. Browning anti-aircraft machine-guns. The second car of the only two Mark VIs to be built had a 6-pdr. gun instead of the 2-pdr. and a coaxial 7.92-mm. Besa machine-gun and the anti-aircraft weapon was a single 0.5-in. Browning on a pintle mounting. Seven hundred and fifty Mark VI armoured cars were on order in mid-1942—500 for the U.D.F. and 250 for the War Office—and production was

South African Armoured Reconnaissance Car, Mark VI—Armoured Car, Marmon-Herrington, Mark VI. This car, the first model, with 2-pdr. as the main armament, is in the Royal Armoured Corps Tank Museum at Bovington, Dorset.

(Photo: S.A. National War Museum)





South African Reconnaissance Car, Mark VII.

(Photo: R.A.C. Tank Museum)

expected to commence early in 1943. However, supplies of automotive parts from North America held back production of all armoured cars in South Africa in 1942; by the beginning of 1943 the end of the war in Africa was in sight and, with operations in the greatly different terrain of Europe ahead, production orders for Mark VI were cancelled.

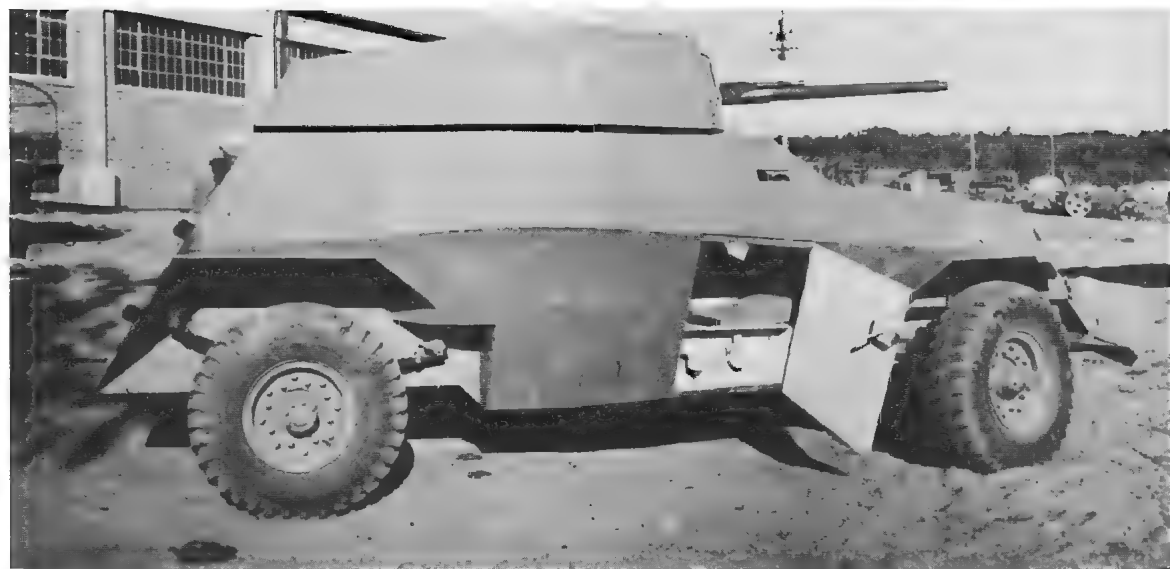
Other South African experimental armoured cars were the Mark VII, which was on very similar lines to the Mark IIIA version with a Vickers machine-gun on an open ring mounting, and the Mark VIII, a

front engined car of broadly the same configuration as the earlier vehicles. It was, however, up-gunned and had a 2-pdr. gun and coaxial Besa machine-gun in an exceptionally long turret which followed the lines of the hull.

For a country which practically had to start from scratch in the development and manufacture of fighting vehicles, South Africa did well to produce armoured cars which were of such sound and practical design and which—particularly in the Middle East in 1941–42—played a very useful part in the war.

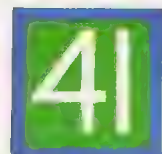
South African Armoured Reconnaissance Car, Mark VIII. The hull design of this car is derived from that of the Marks II and III, but the exceptionally long turret with a 2-pdr. gun is unique.

(Photo: R.A.C. Tank Museum)





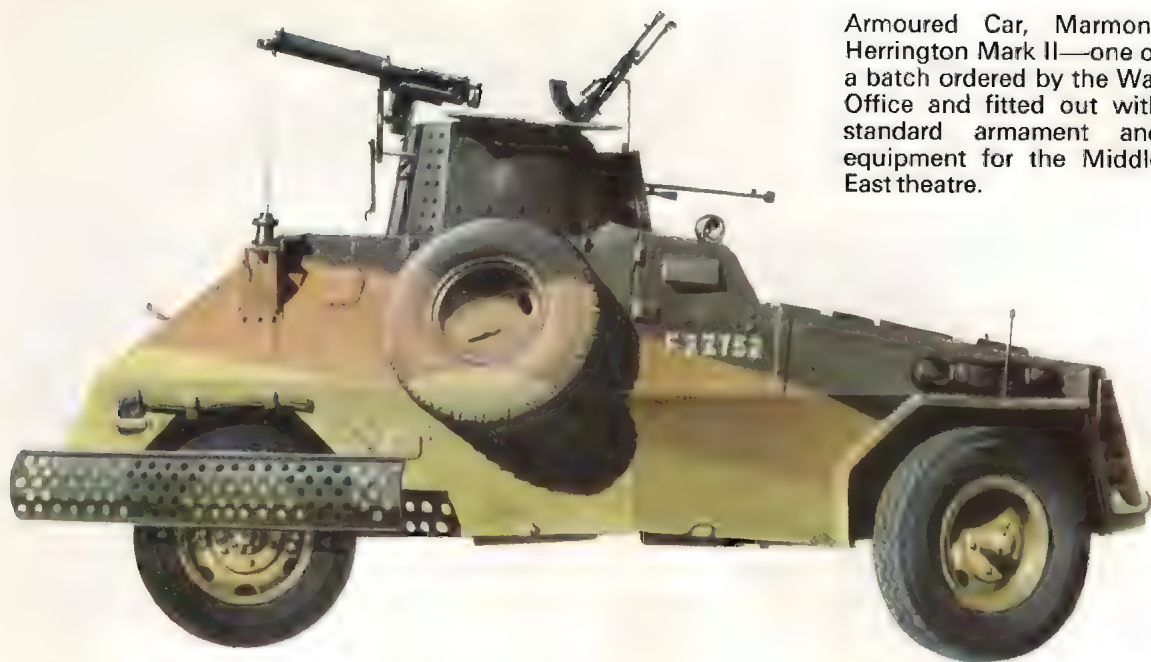
78th
Division
sign



Unit sign

The Car, 4 × 4, Light Recon-
naissance, Humber Mark III of
the Commanding Officer of
56th Bn. Reconnaissance
Corps, 78th Infantry Division,
in Tunisia, 1943.

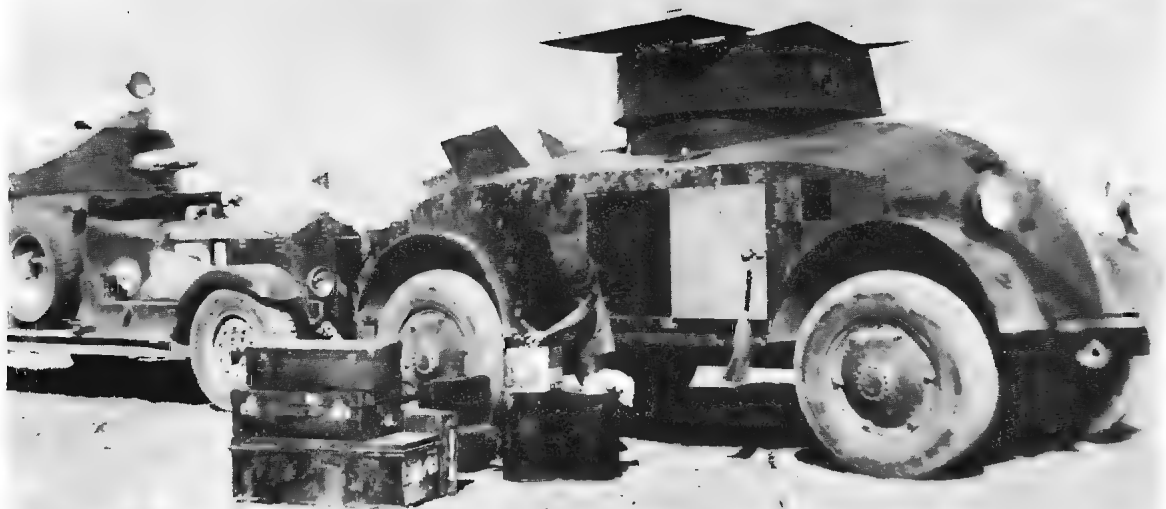




Armoured Car, Marmon-Herrington Mark II—one of a batch ordered by the War Office and fitted out with standard armament and equipment for the Middle East theatre.

Car, Light Reconnaissance, Canadian G.M. Mark I, or Otter I, as used by 4th Reconnaissance Regiment (4th Princess Louise Dragoon Guards), 1st Canadian Infantry Division in Italy. Air recognition sign is painted on bonnet.





*The A.C.2 at a halt in the desert on its way to Baghdad in 1935. Behind it is a Rolls-Royce armoured car with R.A.F. markings.
(Photo: Alvis Ltd.)*

Alvis-Straussler

by B. T. White

THE handful of Alvis-Straussler armoured cars that were used by the Royal Air Force in the Middle East during World War II were, of course, of no material importance at all as far as the war was concerned but these cars represented, for their time, a significant advance in the design of wheeled fighting vehicles. An interesting fact is that a much larger number of cars of a closely related basic design were in service with the German army.

A.C.1 AND A.C.2

The designer of the Straussler and Alvis-Straussler armoured cars was Nicholas Straussler, a Hungarian who later adopted British nationality. Straussler's first armoured car design, known as A.C.1, was constructed—as a prototype only—by the Budapest firm of H. Manfred Weiss R.T. This vehicle, built in 1933, was never fully completed as an armoured car, although the chassis was at a later stage of its trials fitted with a curved mock-up body. Several mechanical features were introduced, however, which anticipated their introduction in armoured cars and other cross-country vehicles built elsewhere. The engine was placed at the rear with the gearbox in front of it. The transmission was led to differentials on the front and rear axles. The suspension consisted of parallel transverse leaf springs under each axle which, in conjunction with the swing axle design, permitted considerable independent wheel movements. As well as

four-wheel drive, the A.C.1 had four-wheel steering.

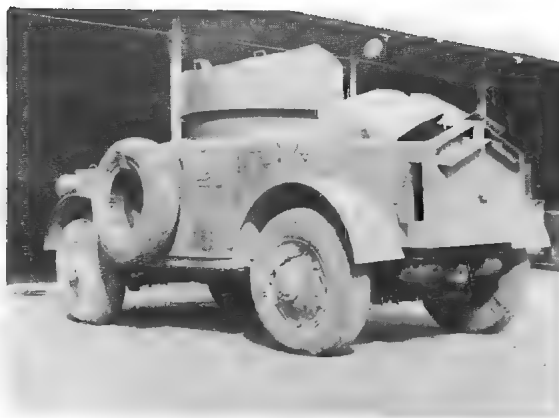
This model led in 1935 to the development of a second type, A.C.2, in which several improvements were incorporated. The square radiator behind the engine with an ordinary fan in the A.C.1 was replaced in A.C.2 by a circular radiator with turbine fan cooling. A second steering-wheel was introduced at the rear so that better advantage could be taken of the ability to steer on all four wheels. The prototype of A.C.2 was fitted only with a mock-up body of curved sheet metal, with a turret ring. A fully armoured version was, however, built, and this had a curved armoured body which could easily be removed in one piece, leaving all the chassis accessible for servicing. The turret had a mounting for a single 0.303-in. Vickers water-cooled machine-gun, although the design provided for the alternative of two machine-guns or for an open mounting for two anti-aircraft machine-guns in lieu of the turret.

A car of the A.C.2 type was supplied in 1935 to the Air Ministry by Straussler Mechanisation Ltd. and trials were carried out by the R.A.F. in the Middle East, where, as a preliminary, it was driven from Port Said to Baghdad.

In 1937 Nicholas Straussler's firm linked up with Alvis Ltd., of Coventry, builders of high quality cars (a firm, incidentally, which had experience with features such as front wheel drive, swing axles and independent suspension) and Alvis-Straussler Ltd. was formed for the design and production of armoured fighting vehicles.



Straussler A.C.2. This photograph shows the high degree of wheel movement allowed by the transverse suspension.
(Photo: Alvis Ltd.)



Three-quarter rear view of A.C.2 armoured car.
(Photo: Alvis Ltd.)

TYPE "LAC"

Before going on to the evolution of the Alvis-Straussler A.C.3, two others of Straussler's armoured car designs should be mentioned at this stage. The first was the type "LAC" which, together with a generally similar chassis designed as a Field Artillery Tractor, was tested by the War Office in 1938. This armoured car was unusual in having two Ford V-8 engines of 88.5 b.h.p. each complete with gearboxes and a novel form of four-wheel drive transmission. The engine on the nearside drove the wheels on that side and the other engine drove the offside wheels, but, as the gearboxes were interconnected, either engine could drive the vehicle in emergency. The trials of this

vehicle showed a very good cross-country performance but the engine cooling was considered inadequate by War Office standards. Since the army was always liable to be involved in campaigns in hot countries the Straussler type LAC was accordingly rejected by the War Office.

ARTICULATED CHASSIS

The other experimental model of armoured car was a prototype chassis (with only a mock-up hull and turret) which was designed on a principle having features in common with the Italian Pavesi vehicles which first appeared in the late 1920s.

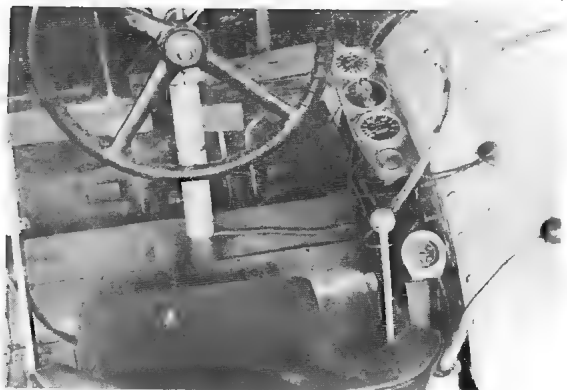


Straussler A.C.1 armoured car prototype with mock-up body.
(Photo: B. H. Vanderveen)



The curved armoured body of the A.C.2 could easily be removed in one piece. Note rear driving position. (Photo: Alvis Ltd.)

Front driving position of the A.C.2. (Photo: Alvis Ltd.)



Straussler's "Hefly" tractor seen here on test in Belgium. The position of the tractor shows how the front and rear halves were able to pivot independently. (Photo: Alvis Ltd.)





Alvis-Straussler Type A.C.3D. This is one of the twelve armoured cars built for the Netherlands East Indies Army.
(Photo: Alvis Ltd.)

In this vehicle, the front and rear halves of the chassis were able to pivot independently about the horizontal axis, although in Straussler's design normal steering was retained, unlike the Pavesi vehicles in which steering was achieved by articulation of the two parts of the chassis. Straussler supplied some tractors to the Air Ministry built on this system, but for an armoured car particular problems with the design of the fighting compartment are involved and by 1938 less unconventional systems of suspension were able to give comparable cross-country performances. Straussler's articulated chassis armoured car does not seem to have got very far, but it is relevant to note that interest in this type of vehicle has been revived in recent years.

A.C.3

The next step in the development of what could be called the main-stream of Straussler's armoured car design was the A.C.3 of 1937, which inherited many features of the A.C.2, including the general layout of body, engine and transmission. The power unit was now the Alvis 4.3 litre engine and the armour was this time made up of faceted plates instead of the previous curvilinear design. The original A.C.1 chassis appears to have been used for mounting the mock-up body for the A.C.3. The six-cylinder in-line engine developed 120 b.h.p. and the Alvis four-speed gearbox was coupled to a two-speed transfer box giving eight speeds both forward and in reverse. Cooling was by means of a radiator each side of the engine. The four-wheel steer-



Rear view of the Alvis-Straussler Type A.C.3D showing the hexagonal radiator grille. The vehicle is on test in Britain. It is at Carter Bar on the border between England and Scotland.
(Photo: Alvis Ltd.)

ing feature of earlier models was retained and there was a full set of driving controls at the rear as well as in the front.

The change to drive on the rear wheels only and steering on the front wheels for normal road work could be effected by a single lever. There was also a choice of two steering ratios for roads or heavy cross-country going.

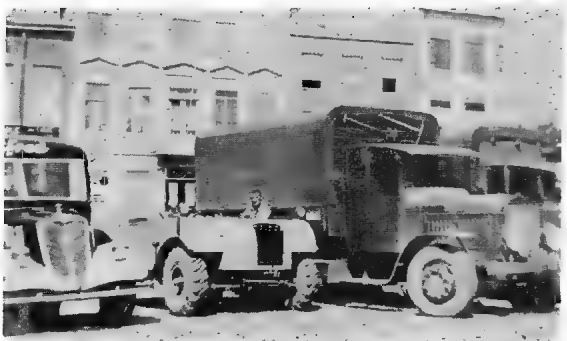
The armament consisted of one water-cooled machine-gun in the turret with the option of a second machine-gun in a mounting added to the left of the driver's visor.

Twelve armoured cars of this model—Alvis-Straussler Type A.C.3D—were ordered for the Dutch East Indies Army (Koninklijk Nederlands-Indische Leger) and were delivered in 1938–39. A change affecting engine cooling appears to have been made in the course of production, because the hexagonal engine grille at the rear was reduced in height in some cars.

Three cars of very similar specification were also supplied to the Portuguese Army.

Earlier, the trials of the A.C.2 by the Royal Air Force had given quite satisfactory results and it was decided to order twelve cars of the later type and a contract was given to Alvis-Straussler Ltd. by the Air Ministry in 1937. These cars were basically the same as those ordered by the Dutch but some changes were specified to meet Royal Air Force requirements. The lower half of the sides of the hull was vertical instead of inward-sloping, giving more interior space, and the hull machine-gun position was absent in the R.A.F. version, which had twin vision hatches for driver and

Front view of "Hefty" tractor (second from left) in Belgium.
(Photo: Alvis Ltd.)



A.C.3Ds after being off-loaded at Batavia Docks, Netherlands East Indies, New Year's Day 1938.
(Photo: Alvis Ltd.)





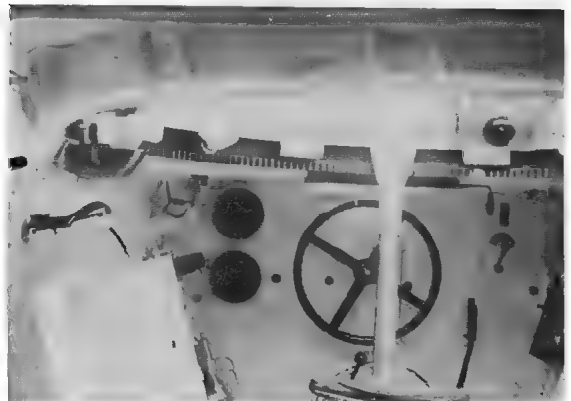
The A.C.3Ds on arrival at Bandoeng, Netherlands East Indies, 1938.

(Photo: Alvis Ltd.)



Front driving position in the A.C.3D. These cars had a crew of four, a top speed of 68 m.p.h., and could climb a 1 in 2 gradient.

(Photo: Alvis Ltd.)



A.C.3D rear driving position.

(Photo: Alvis Ltd.)

Type A Alvis-Straussler in Jerusalem, 1939.

(Photo: Alvis Ltd.)





Type A Alvis-Straussler with the R.A.F. armoured car detachment at Aden, 1938–39.

(Photo: Alvis Ltd.)

co-driver. Also, the wheel and tyre sizes were changed from 9-00–22 to 10-50–20, presumably in order to coincide with standard sizes already in use. There were also various internal changes of equipment to meet the needs of the R.A.F., by whom the cars were designated “Cars, Armoured, Alvis-Straussler, Type A”.

One of the cars built for the R.A.F. was tested for the Army by the Mechanization Experimental Establishment in the summer of 1938 and although it put up a generally satisfactory performance was deemed to be not really fast enough for use by armoured car regiments.

Most of the R.A.F. cars were sent to the Middle East, where the R.A.F. Armoured Car Companies were based, and some, at least, joined the armoured car detachment at Aden.

The earlier Straussler armoured cars were built, as mentioned above, in Hungary where, later, the

Manfred-Weiss firm built a quantity of armoured cars which were broadly similar to the A.C.3D. Fifty-three vehicles were exported and 171 built for the Hungarian Army by whom they were known as the 39M Csaba. Some, at least, of these served on the Eastern Front with the German Wehrmacht.

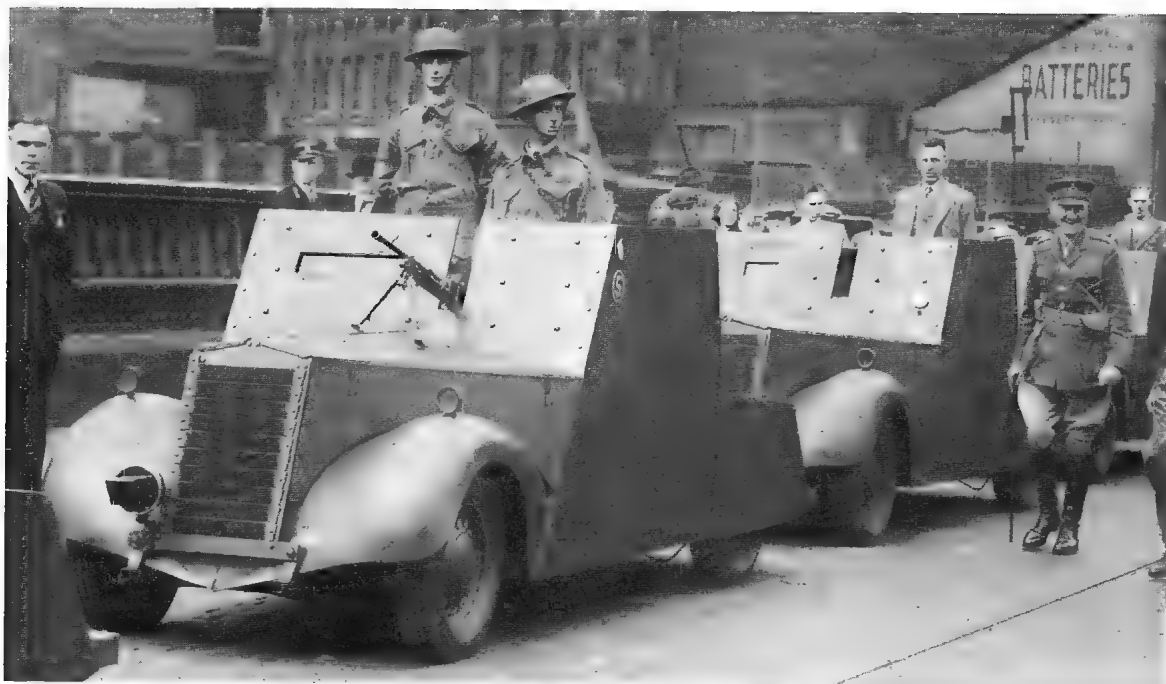
The Hungarian cars mounted a long-barrelled heavy machine-gun together with a light machine-gun in the turret and the front of the hull sloped down to end in a seven-sided nose plate.

Nicholas Straussler's connection with Alvis ended in 1938 (when Alvis Mechanisation Ltd. was formed to take the place and commitments of Alvis-Straussler Ltd.) but he continued to be very active in the field of military equipment. His most famous invention was the DD tank, but he did not neglect wheeled armoured vehicles, one of his later projects being a six-wheeled armoured car on the lines of the Alvis Saladin.

Alvis-Straussler armoured car built for the Royal Air Force—“Car, Armoured, Alvis-Straussler Type A”. The two main external differences from the cars built for the Dutch were the vertical hull sides and the absence of a hull machine-gun.

(Photo: Alvis Ltd.)





Cars, 4 × 2, Light Reconnaissance, Standard Mark II, Beaverette II. These vehicles are on parade with the Sheffield Home Guard in September 1940, but the numbers on the front of the nearest car shows that it was originally ordered by the War Office (and was allocated a "T" prefix applicable to tanks) and then handed over to the R.A.F., presumably for airfield defence.

(Photo: Imperial War Museum)

Light Reconnaissance Cars

by B. T. White

WHEN the Reconnaissance Corps was formed in January 1941 to provide specialized reconnaissance units for infantry divisions in place of the former mechanized divisional cavalry regiments, large numbers of light armoured vehicles were needed to equip it. A proportion of these were found in tracked Carriers similar to those used in infantry battalions, but the majority of the wheeled armoured vehicles needed for operations requiring greater speed and range were Standard and Humber "Light Armoured Cars"

The "Light Armoured Car" class had been evolved of necessity in June 1940 in order to provide as rapidly as possible armoured vehicles to re-equip the British Army after the Dunkirk evacuation and to defend aircraft factories and other key industrial points.

The two principal manufacturers of chassis for the Light Armoured Cars were the Standard Motor Company Ltd. and Humber Ltd.—both Coventry firms. The Standard vehicle was initially, at any rate, produced primarily for aircraft factory defence and was known as "Beaverette" after Lord Beaverbrook, the Minister of Aircraft Production. As supplies of armour plate at that time were at a premium, the protection, limited in the Mark I version to the front

and sides of the crew compartment, was built up of $\frac{3}{8}$ -in. or $\frac{1}{2}$ -in. mild steel plates, backed by 3-in. oak planks at the front. There was no overhead protection or armour at the rear and the armament usually consisted of a Bren light machine-gun. The chassis used was the ordinary 14-h.p. (RAC) type with little modification.

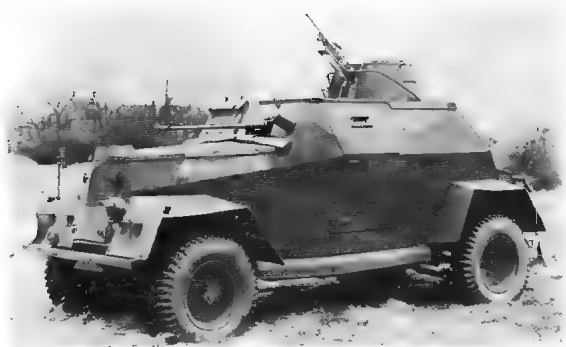
The Humber Light Armoured Car, known as "Humberette", was ordered by the War Office and consisted of an open-top armoured body on a Humber Super Snipe car chassis with a six-cylinder 75/80 b.h.p. engine. Few vehicles appear to have been produced in this form, because an improved version "Ironside I", broadly the same but carried on W.D. pattern wheels with Run Flat tyres, followed soon afterwards and work on the 1,200 of these ordered was being carried out by the Rootes Group in July 1940. The Ironside was named, not descriptively, but after the recently retired Home Forces commander, Field Marshal Lord Ironside.

A slightly improved Beaverette, Mark II, with rear protection added and some slight adjustments in design, was also built, and several mechanized cavalry regiments received Beaverettes as their sole equipment in the summer and autumn of 1940. Pictures of them appeared in the press with highly



Light Armoured Car, Humberette.

(Photo: War Office)



Car, 4 × 4, Light Reconnaissance, Humber Mark III, with radiator doors closed (operated from driver's seat). Boys anti-tank rifle in hull front, Bren gun in turret, and smoke discharger. Driver's visor closed.

coloured accounts of their capabilities—("very fast . . . can negotiate the roughest country"). They were also used in numbers by the Home Guard and the R.A.F. for the defence of aircraft factories, airfields and other vulnerable points.

Humberettes and Ironsides were likewise issued to tankless cavalry regiments and, in addition, to some tank regiments in lieu of scout cars. However, as more tanks, scout cars and proper armoured cars came off the production lines to make up for the losses incurred by the Royal Armoured Corps at Dunkirk, Beaverettes and Ironsides became available in January 1941 to equip the first battalions of the newly raised Reconnaissance Corps, and the new nomenclature of "Cars, 4 × 2, Light Reconnaissance" was adopted for them.

In order to increase production of Light Reconnaissance Cars in 1941, a third major motor concern, the Nuffield Group, was brought in and built the "Car, 4 × 2, Light Reconnaissance, Morris Mark I". This was a rear-engined vehicle with the crew at the front—the driver in the centre, a gunner in a small

turret (normally mounting a Bren gun) at the right and the third man at the left, where a 0.55-in. Boys anti-tank rifle could be operated through hatches in the roof. The smooth enclosed design of the underbelly of this car helped to give it a quite good cross-country performance for a 4 × 2 vehicle. About 1,150 Morris Mark I Light Reconnaissance Cars were completed when production ceased in 1942. To jump ahead in the story, a Morris Mark II was produced to follow the Mark I. This was externally much the same as its predecessor but four-wheel drive was introduced and the front suspension was changed from independent coil springs to semi-elliptic leaf springs. Both models had semi-elliptics at the rear. Approximately 1,100 cars of the new version were built.

Turreted versions of the Standard and Humber vehicles also first appeared in 1941—the Mark III and Mark II, respectively. Both were fully enclosed and in the Beaverette III the wheel base was shortened considerably from 9 ft. 0 in. to 6 ft. 2 in. and large cross-section tyres 9.00-13 were fitted. This car was

Humber Light Reconnaissance Cars, Mark III, 4 × 4, in Tunisia, late May 1943. They belong to Battalion Headquarters, 56th Bn. Reconnaissance Corps of 78th Infantry Division. (Photo: Imperial War Museum)





Three views of Car, 4 × 4, Light Reconnaissance Humber Mark III, which, with Mark IIIA, was the car of this class most widely used by the Reconnaissance Corps in action. Dimensions are: Wheelbase 9 ft. 3½ in., track 5 ft. 1 in., length overall 14 ft. 2½ in., width overall 6 ft. 3 in., height to top of turret 6 ft. 11 in., tyres 9.25 in. × 16 in.

(Photo: R.A.C. Tank Museum)



Armoured Car, Dodge—later known as Car, 4 × 2, Light Reconnaissance, Dodge, and also, unofficially as the "Malcolm Campbell Armoured Car."

(Photo: B. H. Vanderveen)

Car, 4 × 2, Light Reconnaissance, Morris Mark I.

(Photo: British Motor Corp.)





Car, 4 x 4, Light Reconnaissance, Canadian G.M. Mark I, Otter I, of 4th Canadian Reconnaissance Regiment in Italy.

(Photo: Canadian Official)

known also as "Beaverbug I". A further improved model, Beaverette IV, had a redesigned driver's front plate which gave both more room and increased protection.

The Car, 4 x 2, Light Reconnaissance, Humber, Mark II, was a version of the Ironside I roofed-in and with a turret added. At the end of 1941 a four-wheel drive version, Humber Mark III, appeared, looking much the same as Mark II, except for the front wheel hubs and detail changes, but the cross-country capability was greatly improved. The final version was Mark IIIA, in which some improvements were made in the hull design, including extra observation ports at the front corners of the fighting compartment. In all, 3,600 Humber Light Reconnaissance Cars were built (including the 400 Ironside Is) and the Marks III and IIIA were the cars of this class most widely used by the Reconnaissance Corps in action, although many were also employed overseas by the Royal Air Force Regiment for airfield defence. The Beaverettes (2,800 of which in all were built) were, in all Marks, used mainly for home defence by the Army and the R.A.F.—the Marks III and IV perhaps more widely by the latter. The Morris Light Reconnaissance Cars were also widely used by the Royal Air Force.

Morris, Humber III or Beaverette IV cars were sometimes allotted as reconnaissance vehicles to the commanders of other types of army unit such as Royal Engineers companies. In this form the turrets were often removed. Humber III and IIIAs were also used as armoured staff cars, with varying degrees of modification, by formation commanders, recalling (although in a somewhat more utilitarian form) the special enclosed versions of the Ironside, five or more of which were built in 1940 for the transport of Royalty, Cabinet Ministers or other V.I.P.s.

The Canadian Government agreed to produce a Light Reconnaissance Car based on the British Humber Mark III in order to help meet the considerable demand by both British and Commonwealth forces for vehicles of this class in 1942.

The Car, Light Reconnaissance, Canadian G.M.

Mark I, or Otter I as it was usually known, followed the broad general layout and carried the same armament as the Humber III LRC. Standard Canadian General Motors mechanical components were mainly used and the vehicle was slightly longer and 10 in. higher than the Humber. It was also well over a ton heavier than the British vehicle and despite the use of a 104-b.h.p. engine the general performance was poorer, although the Otter was generally quite satisfactory and the 1,761 vehicles built gave useful service with Canadian and British units (they were used by the Army and the R.A.F. Regiment) in the Mediterranean theatre and North West Europe. The standard armament of the Otter consisted of a Bren light machine-gun in the turret and a Boys anti-tank rifle in the front hull (replaced by a wireless set in some cars) although in some R.A.F. Regiment cars aircraft armament was substituted—a 20-mm. cannon in the front hull and twin Browning machine-guns in the turret.

Besides these main types of British and Canadian Light Reconnaissance cars of World War II, there were also a number of armoured cars of various types which were built only as prototypes or in a small production run and which subsequently were classified as Light Reconnaissance Cars mainly, it seems, for administrative tidiness and because they were of inadequate performance for the scout car or true armoured car rôle.

These miscellaneous vehicles included the Car, 4-wheeled, Light Reconnaissance, Dodge, and the Hillman Gnat and Morris Salamander. The two latter types, of 1941–42, were small turreted rear-engined two-seater vehicles designed to use components of existing light cars. Only prototypes were produced. The Armoured Car, Dodge, as it was first known, was conceived by Sir Malcolm Campbell and the first prototype (using a Fordson lorry chassis) was built by Mr. Leo Villa, Campbell's chief racing mechanic. Seventy vehicles on Dodge chassis were produced in 1940 by Briggs Motor Bodies Ltd. They became known among the troops as "Malcolm Campbells".

A.F.V. Series Editor: DUNCAN CROW

Addenda to Guy, Daimler, Humber, A.E.C. Profile by B. T. White.

Under section headed "Scout Cars," add to end of seventh paragraph:

Some information suggests that the Morris design was probably based on one drawn up by Percy Riley in 1937. This vehicle had a tubular backbone and was to have been powered by a shortened version of the 9 h.p. Riley car's 4-cylinder engine, but no more than a full-scale mock-up had been built when the Riley Engine Co. Ltd. was acquired by Lord Nuffield in September 1938.

and add to end of ninth paragraph in same section:

Weight was always a problem with this small class of vehicle. The original specification called for a 25-mm. front plate as the *only* armour protection in a vehicle first intended primarily to lead and protect mobile columns against light anti-tank weapons. This was then increased to 30-mm. and the side plates were introduced as a practical feature to support the front plate. The later requirement for full protection brought problems also with the four-wheel steering and helped the decision to eliminate this feature in later models of the Daimler Scout Car. Subsequently, the call for improved floor protection led to the elimination of the roof in Mk. III to avoid further increase in weight.

AFV/Weapons Profiles

Edited by DUNCAN CROW

Starting with AFV/WEAPONS PROFILE 24 the Publishers intend to step up the frequency of publication. This departure, taken in order to meet the great demand for coverage of more AFVs more quickly than in the programme that has been running for the past two years, has necessitated some further re-arrangement in the list of titles.

31 Australian Cruiser—Sentinel; and Australian Matildas

Designed and built in Australia during World War II the Sentinel was a remarkable achievement for a limited engineering industry, and in its cast hull, for a tank of this size, it preceded the American M48 by about 10 years; it was not the Sentinel, however, that was used in action in the South-West Pacific by the Australians but the Matilda, for which they developed specialised equipments and tactics: BY MAJOR JAMES BINGHAM, *Royal Tank Regiment*, author of *AFV Profile 8* and *AFV/Weapons Profile 25*.

32 M6 Heavy and M26 (Pershing)

This Profile describes the curious history of the U.S. M6 Heavy Tank and highlights the fierce controversy that raged over "giant" tanks—not only in the United States, it must be added; the M26, named after General Pershing, also started life as a heavy tank, and a few were in action in Germany in 1945. In May 1946 the Pershing's designation was changed from Heavy Tank M26 to Medium Tank M26, and as such it fought in Korea along with the M46 and M47 Mediums (Patton) that were a re-built version of it: BY COLONEL ROBERT J. ICKS, author of *AFV Profile 16* and *AFV/Weapons Profiles 24, 26*, who has a close knowledge of the tanks' development.

33 German Armoured Cars

As light tanks became popular in the 1930s the importance of armoured cars declined . . . except in Germany and France; Germany attached great importance to them and they were the basic vehicles of the Panzer divisions' reconnaissance units in World War II, achieving great success as this Profile shows: BY MAJOR-GENERAL N. W. DUNCAN, whose distinguished military career in armour has included service in armoured cars in the *Royal Tank Corps*, and command of the *30th Armoured Brigade* in *79th Armoured Division*. General Duncan has been Representative Colonel Commandant of the *Royal Tank Regiment*, *Governor of the Royal Hospital Chelsea*, and *Curator of the Royal Armoured Corps Tank Museum*. He is the author of *AFV Profiles 5, 9, 12, 15*.

34 Scorpion

Britain's new aluminium light tank, weighing eight tons, powered by a conventional Jaguar XK 6-cylinder engine of 4,200 c.c., and mounting a 76-mm. gun, is the first all-aluminium armoured vehicle in the world: BY R. M. OGORKIEWICZ, author of *AFV/Weapons Profile 28*, who is the first non-American and only the tenth person in its 85-year history to be made an honorary life member of the *U.S. Army Armor Association*.

35 Wheels, Tracks and Transporters British Armoured Recovery Vehicles

The problems of getting tanks to the battle and recovering them when they have been disabled are the subject of this Profile, in which MAJOR-GENERAL DUNCAN (author of *AFV Profiles 5, 9, 12, 15*, and *AFV/Weapons Profile 33*) traces the development in Britain of machines—some like "skyscrapers on roller skates"—to overcome the track wear bugbear until the adoption of wheeled transporters proved a better solution, and Peter Chamberlain describes the armoured recovery vehicles used by British and Commonwealth units in World War II.

36 French H35, H39, and S 35

The Hotchkiss and Somua tanks equipped the *brigades de combat* of the French mechanised cavalry's *divisions légères mécaniques*, two of which had been formed before the outbreak of war in 1939, and there was a *demi-brigade* of Hotchkisses in the *divisions cuirassées*; the Hotchkiss was the second most numerous type of French tank, while the Somua was considered by many to be one of the finest AFVs of its day: BY MAJOR JAMES BINGHAM, RTR, who fought in France in 1940 when these tanks were in action.

37 Russian BT

This series of Russian tanks was based on the American Christie design and its final variant was the forerunner of the famous T-34: BY JOHN MILSOM, author of *Russian Tanks 1900—1970* and *AFV/Weapons Profile 22*.

The publishers reserve the right to alter sequence of list without notice.

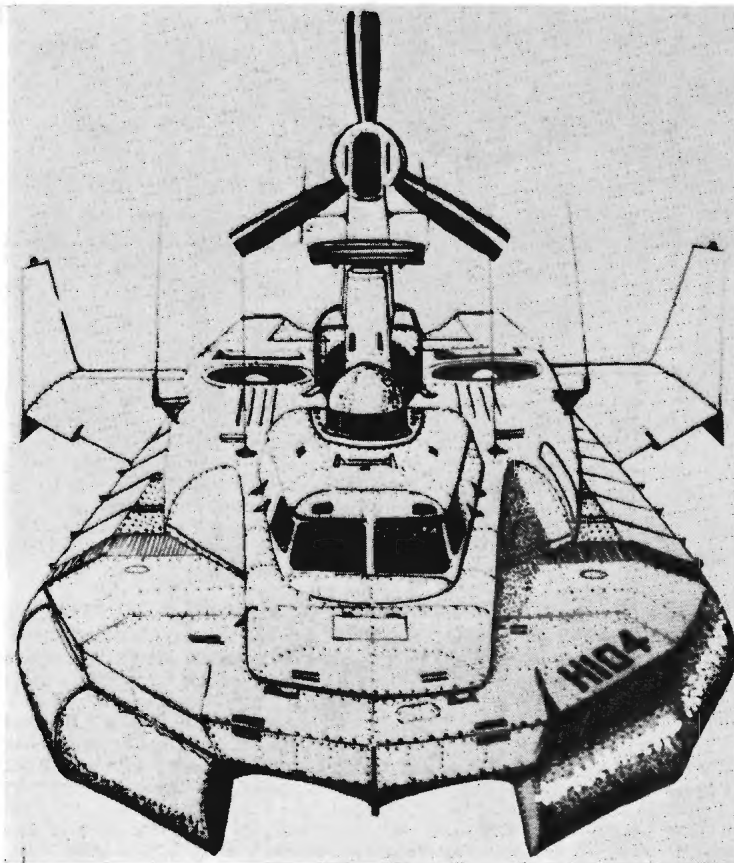
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